

## CLAIMS

1. A process for production of methanol from a feed stream rich in hydrogen, carbon monoxide and carbon dioxide, comprising the steps of

(a) conversion of the feed stream into a converted process stream comprising methanol, aldehydes and ketones in the presence of a catalyst active in conversion of hydrogen, carbon monoxide and carbon dioxide into methanol;

(b) first cooling of the converted process stream to a cooled process stream to 20-200°C;

(c) hydrogenation of the cooled process stream into a hydrogenated process stream rich in methanol and depleted in aldehydes and ketones in presence of a hydrogenation catalyst active in conversion of aldehydes and ketones into alcohols;

(d) second cooling of the hydrogenated process stream to a cooled, condensed process stream; and

(e) phase separation of the cooled, condensed process stream into a gas phase and a liquid crude methanol.

2. A process according to claim 1, wherein the converted process stream is cooled to 80-150°C.

3. A process according to claim 1, wherein the hydrogenation takes place in a separate reactor.

4. A process according to claim 1, wherein the conversion and the hydrogenation take place in a single reactor.

5. A process according to claim 1, wherein the hydrogenation takes place in a tubular reactor being cooled by a cold feed stream to the conversion.

6. A process according to claim 1, wherein the hydrogenation catalyst is a Cu based catalyst.

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7. A process according to claim 6, wherein the Cu content of the hydrogenation catalyst is in the range of 10-95% by weight, preferably 40-70% by weight.

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8. A process according to claim 1, wherein the hydrogenation catalyst is a noble metal based catalyst.

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9. A process according to claim 1, wherein the hydrogenation catalyst is in the form of pellets, extrudates, monolith, catalysed hardware or a powder suspended in a liquid methanol phase.